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Collaborative Creation of Advanced Content in Social Media Services

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Abstract

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The thesis studied rich media Internet applications, especially with regard to collaborative services in social media. The various types of existing and potential content and their production processes were investigated. In addition, the applicable technical solutions for producing rich multimedia online were discovered.

The field was studied by examining previous research and the views of influential thinkers about the subject. As a case study, the production of a website consisting of various social media elements was examined, and the results verified many of the findings in secondary research. The site included an example of a more innovative rich media application, and experiences from its production process were used to define guidelines for the production of similar services in the future.

The project corroborated the view that the user base of social media is heavily segmented, and a small minority typically produces the vast majority of content. A smaller minority participates less, whereas most users tend to be mainly passive. Therefore, if a service aims to reach large amounts of users, the provision of several levels of participation activity was recommended in the thesis.

On the technical side, modern open source solutions were found to integrate well into rich media productions, while the use of Adobe Flash technology continues to be necessary for the implementation of certain features.

Keywords	social media, content production, service design

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Tiivistelmä

Tekijä Otsikko Sivumäärä Aika	Juha-Pekka Yliselä Monipuolisen sisällön yhteistoiminnallinen luonti sosiaalisen median palveluissa 53 sivua + 3 liitettä 23.5.2012
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Insinöörityössä tutkittiin käyttäjien tuottamaa rikasta mediasisältöä hyödyntäviä sosiaalisen median sovelluksia, erityisesti usean käyttäjän yhteistyön mahdollistavien palvelujen osalta. Työssä selvitettiin niiden suunnitteluun ja toteutukseen liittyvät olennaisimmat aihealueet ja ongelmakohdat sekä soveltuvat sisällöntuotantoprosessit.

Lisäksi selvitettiin käyttökelpoisimmat tekniset ratkaisut vastaavien monipuolista mediasisältöä hyödyntävien palvelujen toteuttamiseen, ja selvitettiin sisällöntuotannon dynamiikkaa ihmisryhmissä myös ryhmäpsykologian ja käytettävyyden näkökulmista.

Sosiaalisen median käsitteistöön ja sen laajempaan vaikukseen perehdyttiin tutustumalla aikaisempiin tutkimuksiin ja alan vaikuttajien näkemyksiin. Tapaustutkimuksena tarkasteltiin monipuolisesti aihealueen elementtejä hyödyntävän Internet-sivuston tuotantoprosessia, jonka perustella voitiin vahvistaa monia sekundaarisen tutkimuksen kautta saavutettuja tuloksia. Perinteisempien sosiaalisen median komponenttien lisäksi sivustolle tuotettiin myös vaativampi usean käyttäjän yhteistyötä vaativa multimediasovellus, jonka tuotantoprosessin ja tuloksien perusteella luotiin ohjeisto vastaavien palvelujen kehittämiseen tulevaisuudessa.

Työ vahvisti näkemyksen siitä, että sosiaalisen median käyttäjäryhmä on vahvasti segmentoitunutta ja pieni vähemmistö usein tuottaa palveluissa suurimman osan sisällöstä. Lisäksi hiukan suurempi vähemmistö osallistuu tuotantoon jossain määrin, kun taas suurin osa käyttäjistä on huomattavan passivisia. Tästä syystä päädyttiin suosittamaan eritasoisten osallistumismahdollisuuksien tarjontaa uusia sovelluksia suunniteltaessa, mikäli palvelulla halutaan aktivoida suuri osuus tietystä ihmisryhmästä.

Palvelujen teknisten toteutustapojen osalta todettiin erilaisten nykyaikaisten avoimen lähdekoodin ratkaisujen soveltuvan hyvin rikasmediatuotantoihin, samalla kun Adobe Flash -teknologian käyttö on edelleen välttämätöntä tiettyjen toiminnallisuuksien toteuttamiseen.

Avainsanat	sosiaalinen media, sisällöntuotanto, palvelusuunnittelu

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Abbreviations and terms

RTMP	Real Time Messaging Protocol, used for streaming audiovisual content
SaaS	Software as a Service, model for providing software
JMF	Java Media Framework, a multimedia programming library
PDA	Personal digital assistant
SDK	Software development kit, tool bundle for writing software
API	Application programming interface
jQuery	Open source programming library to enhance JavaScript development
PHP	Programming language
JPEG	Image format
UGC	User-generated content
FLV	Flash Video, a container file format used by Adobe Flash Player
Social media	Term used for of modern web applications, characterized by user-generated content and the promotion of discussion between users.
Collaborative software	Software designed to help teams of people achieve tasks together more efficiently. Mostly used by companies in work-related environments.

1 Introduction

This thesis discusses collaborative media production in the World Wide Web (WWW) powered by modern social media services. In particular, it focuses on collaborative production processes of rich forms of media, such as audiovisual content. The different types of today's social media and online collaboration are discussed, as well as potential future developments in the area. The thesis will also analyze the production and deployment process of a web application that enabled users to create partly self-generated, customized online video content as a part of a youth-oriented awareness campaign.

The goal of the thesis is to examine the possibilities and current state of social rich media content production tools and services on the Internet. Even though an ever-increasing part of the content on the Web is created by users, only a small part of it can be considered collaboratively produced, or particularly rich in content format. Of the central types of social media: Social networks, blogs, wikis, pod casts, forums, content communities and microblogging [1], only text content found in wikis is the product of a truly collaborative process.

Indeed, from a purely technical point of view, it is striking how essentially simple types of media today's user-generated content on the Web consists of. Theoretically, the Internet and collaborative computing place no limitations on the kinds of intricate and revolutionary types of content that could be produced, perhaps generating completely new forms of media. Such could include collaboratively created and combined 3D elements, storylines, rich audiovisual content, real-timeness, interactivity and novel media formats. However, the types of content seen online today are quite traditional and simplistic: text, images, video and audio, typically produced by a single author.

This paper aims to examine the reasons for this, ranging from technical considerations to psychological factors and the current infancy of social media. In addition, the central themes regarding content production and social media will be discussed in this context.

2 Social Media

2.1 Introduction

Because of being in the early stages of its development, definition for social media as it stands is quite elastic. The influential website for social media enthusiasts and professionals, Mashable, refers to the well-known presentation about the topic by marketing executive Marta Kagan [2], who in turn refers to Wikipedia [3], definitions of which are formed in social media itself as the articles are editable by the entire user community.

What is clear is that mass media and communication in general are rapidly changing because of the Internet and users' increased ability to create media and communicate directly to other users [4]. This development is fundamentally changing information sharing structures and logic in societies around the world, with far-ranging impacts in areas like business models, ownership and privacy.

2.2 Types of Services

Social media is facilitated by various online services that offer the user ways to participate in the process of creating and sharing content in different types of media. According to iCrossing, a leading digital agency, current forms of social media can be divided into seven main categories: Social networks, blogs, wikis, podcasts, forums, content communities and microblogging [5].

Social networks

The most prominent ones among social networks are services such as Facebook, MySpace and LinkedIn, each with hundreds of millions of active users. These networks are used to create personal profiles, connect with other users, send messages, share information and use various applications built on top of the platforms. Facebook is the leading social network used for personal contacts, while MySpace is similar but currently declining in popularity, and LinkedIn is used for professional networking.

Blogs

Weblogs, or more simply, blogs are a well-established part of social media, and provide a means for individuals to publish their own stories as posts on a blog website. What separates them from regular websites is that blogs cater for discussion with visiting users while a traditional websites present information in a more confined, one-way manner of communication [5]. Blog posts typically consist mainly of text, but are often enhanced by other types of content, such as video or images. They can be read on the website where the blog resides, or can also be subscribed to as an RSS (Real Simple Syndication) feed. RSS feeds are a popular means for reading updates, since they can easily be combined in a customized reader which combines posts from several blogs, and displays them in the order of publication. Widely varying levels of professionalism are represented in blogs, and they can take a personal, business or political viewpoint among others.

Wiki

A wiki provides users a way to create text content, such as articles in a structured, collaborative fashion. They are particularly popular in creating different kinds of comprehensive cataloged information, and consist of entries editable by the users themselves. These modifications are recorded and debated by the users, who can decide on the most suitable version of an entry based on the policy of the community or organization publishing the service. Prominent examples of such services include Wikipedia, an online cyclopedia with over two million articles, and WikiHow, a massive Internet-based manual with over 136 thousand articles [6].

Podcast

The most popular way of delivering audio in social media context is via podcast. They can often be subscribed to on dedicated websites, or via services such as Apple iTunes. Podcasts offer an alternative to traditional audio content such as radio shows, since they are technically similar, without the real-time broadcast element. Podcasts developed from audioblogs, which were simply blogs consisting of audio content, and began to be called podcasts when subscription in RSS format became available, and automatic subscription to a device like the iPod became popular. It has been suggested that

the popularity of podcasts in contrast to other forms of audio content is due to them having easier access and availability [7], as they are automatically transferred to a device, but can be consumed at any time most convenient for the user.

Forums

Forums were among the first forms of social media to arise, and remain a highly popular ingredient in online social interaction. They generally focus around a certain topic and contain multiple discussions consisting of publicly visible messages posted by users. Forum discussions, formed of multiple posts, are called threads. As with blogs, forums come in a wide array of topics and varying standards for content. They typically have users with different levels of user privileges, such as novice or senior members and moderators. Some require registration in order for users to contribute, while others allow for anonymous posting as well. Forums can be considered the successor for pre-Internet services such as Usenet groups and text-based Bulletin Board systems [8,229], which facilitated for group discussion in the era before wide-spread Internet availability.

Content communities

Content communities focus around a particular form of content. Prominent examples include YouTube, a video sharing site and Flickr, a service for sharing images. Users create profiles in a similar fashion to social networks, but only publish content of a certain type. These specialized sites are often used to host specific content that is then embedded or linked to elsewhere on the Internet. Many of the most popular content of the most popular content communities, such as Youtube and Flickr, have had problems with their profitability despite their massive respective user bases [9; 10]. This is mainly due to the equally enormous costs related to serving millions of large files, as is the case for image or video content, to millions of users daily. In fact, in the case of YouTube, an estimated four billion videos are served to the public each day.

Microblogging

Microblogging is a slightly more recent but wildly popular form of social media. It was started in the second half of the 2000s by services such as Twitter, Jaiku and Tumblr,

when it was discovered that people enjoyed the low-barrier way of publishing thoughts and ideas as short posts. The post title was omitted, and Twitter famously restricted post characters to 140 to make sure the conversations stayed compact and did not turn into prolonged writings. These short posts became part of common contemporary language use known as *tweets*. Facebook and other social networks also incorporated the microblogging feature as part of their service as *status updates*, which form the main content feed provided by the service.

2.3 Service Design

Each form of social media service has a certain blueprint, logic and work flow that provides users the framework for creating content themselves. Decisions made in the design process highly influence the user experience of the service and the culture that forms around it. A practical example of such design choices is the inclusion of a voting option relating to another user's post. A ”thumbs up” or ”thumbs down” action may be provided, as in the case of YouTube, while Facebook prominently opts for users only being able to give positive feedback via a similar one-click action interaction. This mechanism is famously called the Like button.

Facebook is a good example of a service which is in constant development and redesigns the look and feel of the service periodically. Changes have been made into the look and feel of the users' profile pages, how third party applications can operate in the environment, what is private, how much control the user has over his or her experience, and what the relationships between users, pages, groups and applications are.

In forums, blogs or content communities, it is up to the service design to establish the rights and abilities of the user who creates a topic, group, channel or conversation. In some cases, he or she may be able to add other moderators, block posts, disable commenting or to archive a conversation, among other things. Forums focus mostly on topics and conversations, created by a certain user, but typically not controlled by the same individual. Profile pages are not particularly relevant in forums, while in other services, such as blogs, social networks and content communities, they are central features of the service. Depending on the type of service, they can be referred to in

various ways: user channels, content pages or blog pages, but they all share the feature of being the central "home page" for a single user.

Some services may also provide users with statistics about the visitors to their page. That could mean simply page views, but it can potentially also identify a particular person, the amount of her page views and browsing paths, along with exact timing and geographic information. As an example, LinkedIn provides the identities of profile page viewers to the user, while Facebook offers no such information.

The design blueprint also defines the way media content is created inside the service. In wikis, the users are enabled to create and edit any article they wish, thus having control over the entire content base. In blogs, authors create posts on their respective blog pages, consisting typically of text, images and video. Content communities have established various customized ways that users can create, edit and enhance their media content prior to publishing. This is typically done by the users themselves when uploading content to the service. Microbloggers generally only publish text, and use links to other services to publish other types of media content.

2.4 Growth and Impact

In the last few years, activity on social networking sites has more than quadrupled [11], and 80% of American Internet users are creating or consuming some form of social media every month [12]. Facebook, the largest of current social networks, has an active membership of over 500 million users [13], growing by approximately 0.1% every single day [14]. The most active web use is often attributed to younger generations, but huge growth is currently being seen also in the participation of older people as well. The middle-age demographic makes one of the main and most active user bases for Twitter, which in fact is a network not particularly popular among teenage web users [15].

Newspapers

The rise of social media has had profound implications on many industries, one of the most prominent ones being the traditional newspaper industry. Consumers' time spending habits are tilting more and more towards the Internet as a source of infor-

mation, and users expect to get their daily news from quality online sources. Traditional news outlets face considerable amount of competition from independent news bloggers while struggling to find a working business model for the online versions of their publications.

Users still consider news outlets a credible source of information, but the vast supply of free news sites guarantees that old-fashioned subscription-based models are generally not very successful. Some news sites, such as Wall Street Journal and the Financial Times, are among the few companies successfully utilizing by the subscription model. However, most mainstream news organizations consider keeping their sites pay-free to be a better option, while collecting the revenue through other means, such as advertising.

Irrespective of the business models implemented, the newspaper industry's collective total advertising revenue, consisting of print as well as Internet domains, is in sharp decline, as seen in Table 1.

Table 1. U.S. News organizations' total advertising revenue 2000-2011, copied from Newspaper Association of America [16].

	Print Total	Online Total	Combined Total
	Millions USD	Millions USD	Millions USD
2001	$44,305		
2002	$44,102		
2003	$44,939	$1,216	$46,156
2004	$46,703	$1,541	$48,244
2005	$47,408	$2,027	$49,435
2006	$46,611	$2,664	$49,275
2007	$42,209	$3,166	$45,375
2008	$34,740	$3,109	$37,848
2009	$24,821	$2,743	$27,564
2010	$22,795	$3,042	$25,838
2011	$20,692	$3,249	$23,941

In only five years, the total advertising revenue of U.S. news industry has fallen by an alarming 51.4% [16]. Attempting to adapt to the new business landscape, news outlets are hard at work innovating and experimenting with various social media strategies. Newspaper organizations are broadening their online offerings to include many social media components, such as blogging by journalists and columnists, discussion forums and newsreader applications in social media services.

One recent and innovative such initiative was the Social Reader application, integrated into Facebook's platform. This partnership has provided the participating organizations, Yahoo News, The Washington Post, The Independent, and The Guardian with millions of readers. It aims to make the consumption of news a more social experience, with features such as automatic updates for friends on each article that is read.

Advertising

An ever-increasing part of the general public's time is spent online instead of traditional media channels, such as radio or print media. This has made the Internet the most important part of the marketing mix for many organizations. Social media is becoming the leading destination where users spend their time [17], and Facebook usage in particular is rising fast. In 2011, the average U.S. user spent nearly eight hours using the service, rising from less than six hours a year previously [18].

While television is still popular, new technologies enabling the prerecording of shows with automatic removal of advertisements is making harder for TV commercials to gain attentive viewers in the same numbers as earlier. Product placement in the shows themselves is increasing because of this, but most marketers are also looking to engage the consumers of their brand by new forms of advertising provided by social media and other digital avenues.

Internet in general

While on the Internet, more and more time is spent on social media also in comparison to traditional websites [19]. In his F8 conference keynote speech, Facebook CEO Mark Zuckerberg envisioned a web which is permeated by social connections, and Facebook providing the means for its entire interconnectivity [20]. The company is indeed in-

creasingly becoming a preferred way of logging and authentication on websites, and not having a profile in the service makes using such sites all but impossible for the visitor.

The lack of engagement and participation on social networks can also inhibit receiving advanced content on the many sites, such as customized suggestions based on areas of interest or friend recommendations. Facebook has also started to provide businesses the option to create highly customizable Hypertext Markup Language (HTML) based websites embedded into its business pages, potentially even making companies' own websites obsolete in some cases.

3 User-generated Content

User generated content (USG) is one of the main components of social media. Without it, most of today's social media would simply not exist. Instead of professional writers, photographers or video production companies, the content spread on the Internet through social media is predominantly created by users themselves. Already in 2004, a comprehensive study by Pew Research found that 44% of Internet users in the United States had shared content in social media. Considering the trends surrounding the field, it is safe to say that most current Internet users have contributed to online content in this way.

From a publisher's perspective, USG can be seen as free content profit from. After all, in the pre-Internet world publishers would always generally need to pay for the content used in their publications. Then what are the reasons behind creating content if no monetary benefit is involved? The existing social media suggests it is in the nature of people to share as well as consume thoughts and ideas in the ways they are capable of once given the tools for it. Research has pinpointed some of the main motivations as being minimizing self-doubt, creating a sense of belongings, and feeling important. In any case, activities like discussing, sharing and interacting with each other, also in terms of USG, is central to human social behavior, and is generating $450 million in advertising revenue per year. [4]

Delegating content production to users, or *crowdsourcing* in comparison to traditional outsourcing, has been an incredibly popular aspect of services in the social media era. Users can publish their content for free, but at the same time they are contributing to the platform's content base. By using crowdsourcing it is also possible for individual users to become a part of a project that they would not be able to accomplish themselves with a reasonable amount of effort. One example of a service of that kind is the website kickstarter.com, where single users can donate small amounts of money to enable the creation of a variety of projects. The final product of the project can be a company, music record, a reissue of a vintage videogame or a specific event.

Crowdsourcing is also used in scientific projects by taking advantage of the massive processing power tens or even hundreds of thousands home computers to analyze

large quantities of data. One such volunteer-based project, SETI@home, aids the Search for Extra-Terrestrial Intelligence program to find traces of alien intelligence in radio signals from outer space. In this type of distributed computing projects, no actual actions are required in the part of the user, but the contribution is made by a separately installed program, to automatically use the resources of a computer when it is idle and not used for other tasks.

A kind of a crowdsourcing philosophy can be seen behind the open source software movement as well, where software source code is freely available for any user to use, modify and share back in return. The open source movement has accomplished some truly extraordinary achievements, worth the envy of any commercial company. Among those are entire operating systems (Linux), browsers (Firefox), database management systems (MySQL), office suites (Open Office) and image manipulation software (Gimp). Software development projects are also experiencing changes resembling social media as many services, such as Spotify and Facebook, have opened their platforms for independent third party applications to further enhance their products user experience.

USG is typically free of charge and freely available, and as such sites are also creating novel ways of integrating and presenting that content, and even creating new types of media in doing so. One such way of presentation in social media services are *mash-ups*. They combine a number of freely available content and data to create a new type of presentation that provides additional value for the user. Many mash-ups often categorize the data by utilizing *tags* that users have associated with a particular piece of content. Tagging enables such features as placing several piece of content from different sources on a map by their tagged coordinates, or listing news articles of various publications in a single interface ordered by the publication time.

There are also services and sites specialized particularly on tagging and labeling content, called *folksonomies*. These services enable users to organize the massive amounts of data and information available online based on tags and bookmarks attached to content by other users. The aim of services such as Delicious and StumbleUpon is to sift through and present the most relevant content to the user by the taking advantage of such tagging functionality. Following the continuous development of social media, what is interpreted as content has also changed since the days of Internet before it, when more traditional content was playing the lead role.

Indeed, much of the content produced on the Internet by users is often produced without them even perhaps fully realizing they are participating in its creation. Such content includes viewing, liking and commenting and different actions a user can make on a website. Much of the user's activity is also recorded without any particular agreement or notice. Web server software routinely records the page loads and viewing times of individual users in access logs, and more advanced JavaScript-based tools for similar functionality has long been offered by services like Google Analytics. They create easily viewable and very intricate sets of data of website traffic through a well-designed and intuitive user interface. Many companies, such as Facebook and Google, combine this detailed knowledge of the users browsing habits with data on the user's areas of interest, likes and associations and leverage that data to provide more relevant advertising content to the person in question. The data can also be used to create more relevant, rich and meaningful experience for the users, and in order to customize the service experience in this way, knowing something about them is required [21, 76]. Due to the open nature of the web and social media in it, this type of massive scale data gathering can also be seen as a new type of content taking form.

3.1 Social Media and Content Creation

The most common content types users share in social media are text, images, video and audio. These pieces of media are most commonly produced and published by one single user, as illustrated in figure 1.

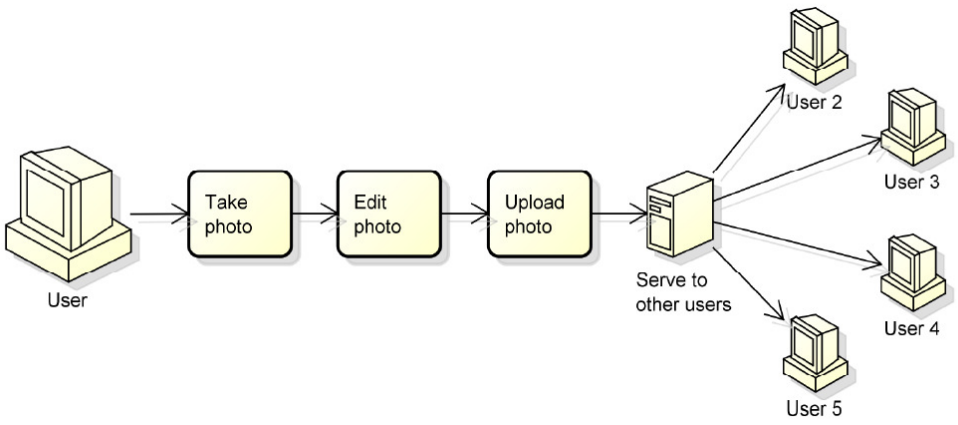

Figure 1. Content creation workflow in an image content community.

A user follows a linear path of delivery serving the content to the wider audience. Other similar pipelines of content creation include blogs, where a user typically composes a post of self-produced content and possible third party elements, as seen in figure 2.

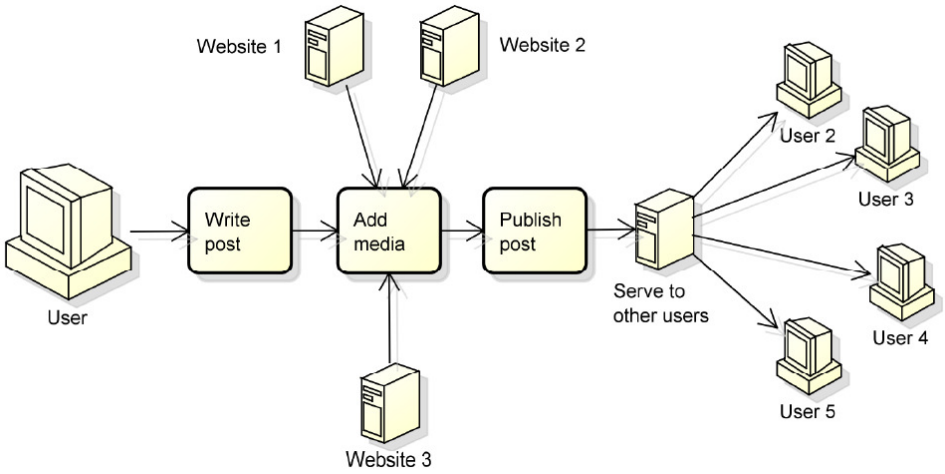

Figure 2. Content creation workflow in a blog.

These types of methods are the most common ones found on the web when it comes to content creation, exceptions to the rule brought about mainly by discussion forums and wikis. In forums, discussions can be seen as a piece of content that is produced by several individual posters. These posts may or may not be editable, but no one has full control over the discussion, with the possible exception of a moderator. Even in the presence of active moderation, the moderators alone cannot create a true forum, since its essence includes participation by the public.

Wiki articles, on the other hand, differ from all other forms of the most popular social media content in that they are truly editable and even completely rewritable by any user visiting the site. This fundamental difference in approach is well demonstrated by figure 3.

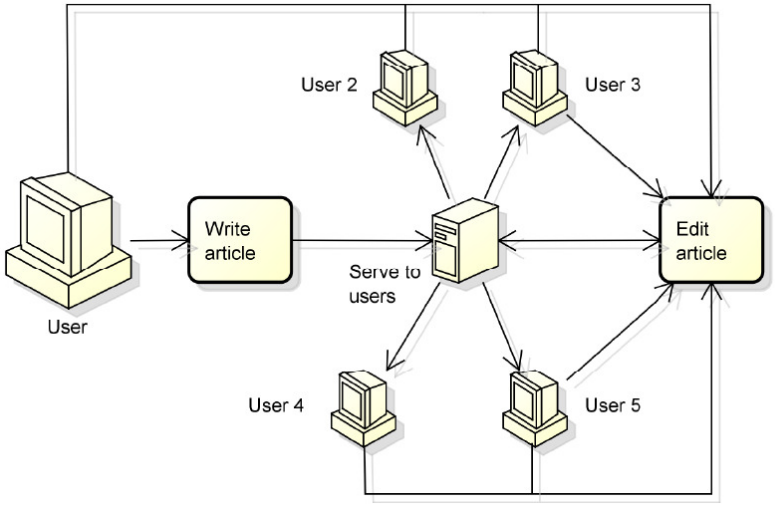

Figure 3. Content creation workflow in a wiki.

When compared to the work flows in previous examples, a wiki article stands out as a piece of truly collaboratively produced media. This model has been called a many-to-many type of communication enabled by social software, in contrast to one-to-many, as in broadcast, or one-to-one communication, as in the case of the telephone [22]. In theory, there is also no restriction why software designed by a many-to-one communication model of could not be successful as well, for example for the purpose of communicating upwards in a social hierarchy. However, the practical examples to this day have been insignificant if not nonexistent. An aspect that could promote group creation of content through social software could also be that it facilitates for group integration and feeling of control over the content, as found one research [23].

Most pieces of media produced on the Internet clearly are created utilizing single-producer work flow methods. What is it then that is inhibiting multi-producer work flows from becoming more commonplace and for users to adopt them in creating engaging online content as a part of today's social media? Multi-author production is more complex by its nature, and perhaps the additional innovation required to create such services without lengthy processes required could be factor. Such services, though more elaborate, must accommodate for the shortness of Internet users' attention span [24], and be easy to flow in and out of.

In case of richer media content being produced with the multi-producer model, technological shortcomings can still form a factor, since high-quality video and audio produc-

tion is not always possible even on the desktop, let alone in Web applications. Although some formerly characteristically desktop software suites are migrating to the web using the Software as a Service (SaaS) business model, Microsoft Office as a prime example, the same has not happened for professional video or audio production software to a large extent. Adobe actually forms an exception, having launched a stripped-down web-enabled version of its professional Adobe Premiere video editing software, called Adobe Premiere Express, but it is only licensed on a per-project basis and no pricing information is publicly available for the solution. By far, most video editing is still taking place on desktop versions of the software. On the audio front, digital audio desktop workstations have a long and established position in their respective industries, and the rise of the Internet has not yet prompted such audio software companies such as AVID to take action in the cloud computing direction. That is not to say that online collaboration in the audio realm is not being envisioned and even slowly provided by certain companies. One such example is the eJamming service, which enables users to record and mix audio via the Internet regardless of location. This technology still has its glitches however [25], and is certainly yet to be developed into a more social type of a service, but the trend for these types of features moving to online channels is evident.

Wikis clearly form an exception when it comes to production processes of online media, but what is the state of collaboration when it comes to other forms of text content on the web? An example of such a form is a discussion thread, found on forums, networks and blogs, which can be seen as a sort of multi-author pieces of textual media. Aside from that, collaboratively produced pieces of text are quite far and between. One such example of interesting new ways of social collaboration in textual media production is however the website storytimed.com, where users can create entire stories in a collaborative fashion.

Among the factors hindering the proliferation of these services can be just simple human resistance to change. The arrival of personal computers in the eighties was a massive shift to office employees accustomed to paper-based manual working environment. In the same fashion, though today's companies are attempting to introduce more advanced communication methods, email remains the preferred means of group communication to many people. From this perspective, it is not surprising that adopt-

ing any group-based content production pipeline will face considerable resistance since it is destined to be somewhat more complex in relation to one-to-one or one-to-many type of communication methods.

In addition to being as simple as possible, such social production designs will probably need to provide different levels of capabilities for particular types of users and promote the right kind of content creation to get meaningful results. Clay Shirky, an American New Media author, writes that from the perspective of results, simply users enjoying the use of software is not is enough. As in social gatherings in real life, a group needs a certain structure to its activities in order to achieve a desired outcome. He also proposes that usability should be designed with the focus on the group instead of its individual members. [22]

For example, there needs to be a way for a social application to deal with the highly varying interest and motivation levels among individual users in a group. Yochai Benkler of Yale Law School and Helen Nissenbaum of New York University suggest that this should be mitigated by component modularity, as well as their granularity. This means that the different parts of the production should be divisible to sub-parts and those parts be worked on in very small contributions if a user so decides. [26, 401] Prime example of this is Wikipedia, where most users only read, some are highly active in writing and debating the articles, while other contributors are only interested in modifying minor changes, such as typos in the text. The challenge in catering for different types of user abilities and preferences in these types of group-based systems no doubt has contributed to the fact that such processes have not become a larger part of the social media landscape.

3.2 Collaborative Software

In the corporate world, online collaboration has been taking place on a larger scale than in social media. The move towards working on documents in a collaborative fashion over a network begun in an extensive manner in early 2000s when today's well-established enterprise platforms, IBM Lotus and Microsoft Sharepoint entered the market. This kind of working method enabled teams to collaboratively create, edit and share documents over a network in a client-server type of system architecture.

The use of similar, so called *cloud computing* platforms has seen a prominent increase in recent years, with the notable introductions of Amazon Web Services in 2006, Google Docs in 2007 and Microsoft Office 365 in 2011. Cloud computing collaboration software is provided from ”a cloud”, a large external server architecture, which makes these types of system highly scalable, meaning that additional server resources needed for large scale bandwidth use can be deployed instantly, without adding new dedicated servers for the task. In enterprise collaboration systems, users are typically able to manage document access rights and determine the visibility of documents to other users. These types of solutions also often offer features like website publishing or instant messaging, among other things, and can be accessed by various end devices such as personal computers (PCs), tablet computers and personal digital assistants (PDAs). Collaborative software is particularly effective when workers are placed in physically distant locations, and provide a centralized environment for managing the work flow of such teams. Much of the software use is focused on managing traditional office documents, such as text documents, spreadsheets and presentations, but collaboration technology also provides the means for integrating more sophisticated business-specific tools in the environment, such as custom third-party CRM or ERP applications.

3.3 Online Production of Audiovisual Content

The sources of video content in a modern consumer environment are can essentially be divided into video camera recordings, clips produced by different types of software and existing video clips from a third party source. Similarly audio content can be thought of as coming from three main sources, self-made audio recordings, audio produced by software and existing audio tracks created by outside sources. When envisioning social software making use of audiovisual elements, these would be the types of elementary building blocks that a potential user group could be considered to provide.

The production of audiovisual can be executed in various technologies, but for the sake of context, we will focus on technologies that are viable for direct access with a browser, and will purposefully leave desktop solutions out of consideration. At this time, the browser has essentially only one means of accessing webcam data, and that is the

Adobe Flash Player plugin. It is an extension to the main browser software, and is often preinstalled in browsers or can be downloaded from Adobe's site. Once installed, it will render the portions of the browser window where Flash content has been embedded. Since the introduction of web capable mobile Apple devices, such as iPhones and iPads, much of web development is steadily steering away from Flash, since Apple made a decision not to include Flash as an option on the devices. This decision by Apple then-CEO Steve Jobs was rather bold at the time, considering that Flash is still installed on 99% of Internet capable computers in the U.S. [27], and still used for much of the interactive content on the web.

In any case, the progress is clearly towards the standards-based technologies of HTML, Cascading Style Sheets (CSS) and client-side programming language JavaScript. With the increasing adoption of the latest specifications, HTML5 and CSS3, many of the interactive features in web applications are possible to implement without Flash components, which was not the case just a few years ago. However, some features such as web cam access are currently only in a draft proposal stage, and only available as experimental features in mainstream browsers [28].

Another technology that could be considered for the task of recording web cam output through the browser is Java, widely available on 73% of computers [27], more specifically Java applets. These are small Java programs running inside the browser though a Java browser plugin. However, applets run inside a restricted sandbox for security considerations, and as such cannot access the user file system or record images from the users web cam [29]. Nevertheless, a Java technology called Java Web Start could provide this functionality by running the application outside the browser as a separate Java application, and the browser simply prompting the initialization of such a program. An outside Java program would be capable of capturing and processing webcam and other audiovisual content is Java, with the aid of the Java Media Framework (JMF), a comprehensive Java library specifically designed for manipulation of audiovisual content in applications.

Microsoft has a similar functionality, called ClickOnce, available in its .NET framework. The .Net framework is only however only available for Windows systems, and applications based on it would not be available for other platforms. As such, it does not make

for an optimal technological solution for a web based audio-visual collaborative social software.

3.4 Legal Issues

Content ownership

As stated earlier, social media and the Internet in general are creating challenges and changing the landscape in a wide variety of fields in society. One such field is content ownership and intellectual property. Before the arrival of Internet technologies, it was clear that once a written text was published, say by a newspaper or a book publishing house, the author obviously had full ownership and could sue for copyright violations if the text was used in other contexts. The story is often quite different in the case of USG and content produced in social media. Facebook terms of use have sparked plenty of debate over a reasonable model for content rights in these types of services. In its terms, Facebook claims for very extensive license to permanently take advantage of the content produced by a user, and one privacy advocacy group described them mockingly as saying the company may forever do whatever they desire with their customers' content [30].

Indeed, Facebook terms have generated considerable resistance from courts and academic circles [31; 32]. In particular, the provision in the terms that retain usage of USG after user deletes an account prompted much controversy. For Facebook, the content and associations created within its service provides the data pool that enables the highly targeted marketing that the company makes its profits from, and as such it is no wonder it wants to ensure access to the data as broadly as possible.

The way a user can state clearly the extent of ownership to content can also be challenging in a way that is both comprehensible and legally valid. Some services, like Wikipedia and The Freesound Project have opted to use so called Creative Commons licenses to tackle the problem. These licenses, comprehensive but minimal in nature, provide a way for a user to quickly understand what rights are licensed to others using the content they have created. In case of Creative Commons, simple visual icons are

used to illustrate the extent of the license to the visitor coming across the licensed content.

Privacy

Besides ownership, a major legal issue social media has battled with since its birth is privacy. In many types of social media, such as blogs or podcasts, it is obvious to the user that anything getting posted will be public. However, privacy issues easily get very blurred in case of social networks in particular. Only recently have services such as Facebook started to denote the extent of visibility for a piece of content. Facebook is based on private relationships between people, and the kind of private discussions and keeping in touch with people one cares about is at the center of what makes it so wildly popular. However, the vision and attitude of the company concerning privacy is perhaps best exemplified in the founder Mark Zuckerberg's statement in 2010, suggesting social norms having so profoundly, that privacy as a concept was losing its significance [33]. For a user concerned in the privacy aspect of their life and communications, another interesting point is that Facebook's Terms of Use grant the company perennial rights to any UGC produced within Facebook [34, 89], including such things as private messages, deleted content and all personal information.

Another threat to information privacy in social networks is their provision of data to third parties in the form of applications, such as websites or games that leverage on Facebook data to create richer experience for the user. In the case of third parties, the same privacy-protected information is provided to them that Facebook is entrusted to keep private. Usage licenses define the acceptable use for such data, but in the end there are no technical restrictions that disable the unauthorized use of user data. In such cases, when the user grants an application access to her data, she also has to simply trust the developer of the application to handle the information appropriately and with respect. So for the extremely private person, social networking sites pose many challenges indeed.

Traditionally, people have had different spheres of social interaction, such as home, workplace, hobbies and groups of friends. In these different contexts, people could express and cultivate different sides of their personality, and perhaps suppress certain characteristics as appropriate. In the kinds of social networking tools available today,

maintaining such differences is quite challenging. Facebook as an example, does provide the possibility for the user to categorize contacts into different lists, based on actual social relationships, but managing such lists can become quite challenging at the same time when lifestyles are becoming more and more hectic and fast-paced, friend counts in networking sites often extend to hundreds of contacts [35], and Internet users generally only browse through much of the content of websites [36,21]. However, it has been suggested that notions about privacy are changing, and people, while aware of there being no absolute guarantee of privacy, are willing to accept this as a price of participating in the social online experience [37,181].

Another privacy-related aspect in social media is the role of user tracking. Analytics software such as Google Analytics has made it commonplace to record page views, browsing paths and visit times on ordinary websites, and user surveillance on social media sites forms no exception in this respect. The only difference is that in addition to outside users, of which an IP address is recorded, users inside a network can be pinpointed and identified in absolute terms. Detailed information about the user's actions and activities by such tracking technology form an obvious privacy issue, but as in the case of all other information, rights to use for the use such content are being offered to the service provider when its services are used. As mentioned earlier, different conventions exist between services on the amount of identifiable information provided to users about the viewers of their content, such as profile pages. Legislation concerning user tracking varies, as in some areas disclosing the collected information is mandatory, and users need to be notified in case of confidentiality being compromised [38].

Copyright infringement

Social media is based on massive amounts of content produced by the public, and as such, full control over the entire body of content is all but impossible to implement. The posting of copyrighted content is therefore easy, and something that has caught many headlines especially regarding to content communities, such as YouTube. Due to the massive amounts of video material uploaded on the site daily, it has adopted a ”removal-on-request” type of policy when it comes to copyrighted content. Under such policy, the service agrees to remove any piece of content deemed copyrighted, but only upon request. The procedure is based on United States a copyright legislation

Digital Millennium Copyright Act (DMCA), which is based on international treaties regarding intellectual property. Under the law, Internet Service Providers (ISP) are protected from copyright infringement lawsuits if they provide reasonable means for content removal on request. DMCA was made into law in 1998, and disagreements have existed on its interpretation, resulting in court cases. One of the most prominent ones was Universal Music Group's suit against YouTube regarding the extent of YouTube's liability in the case of illegal content available through its service. The case was originally ruled in YouTube's favor in 2007, deeming the site's removal policy as lawful. However, an appeals court in April 2012 rejected the decision, and the matter continues to be debated in American courtrooms [39].

The content owners do not have absolute power related to removing content containing copies or derivative works of their works. The aspect of any user's right to fair use of content came into spotlight when a record label ordered YouTube to remove a user's video that had the label's song playing in the background [40]. Fair use determines the right the use copyrighted content in certain contexts, without the explicit approval by content owner, when certain characteristics are met, concerning the purpose and extent of use, among others [41]. One of the most common and obvious of such is the use for educational purposes [42].

Illegal content

Similarly to DMCA video takedowns, other types of illegal material in content communities are typically reviewed and removed only after user notification. Content to be removed may include such elements as violence, drug or animal abuse, pornography, hate speech or predatory behavior, among others. It is no surprise that YouTube is also battling against pervasive pornographic content on the Internet, since it has been found that 12 percent of websites and 35 percent of all Internet downloads are porn [43].

Sexual misconduct and constructing protection mechanisms for children in social networks is clearly one of the current issues of our times as well. In an extensive study on the matter, it was found that the vast majority of boys and girls had been contacted in a sexual manner and around half were proposed undressing on web cam [44]. Social media, with its sometimes obscure privacy mechanisms and ease of contact has obvi-

ously contributed to the rise of such phenomena, and some politicians have even proposed for the restricting the access onto such sites for young people, in addition to the minimum age required by some social networking sites [45].

The potential for defamation is another concept many social media users are not fully aware of while publishing content online. Considering the border for such writings has been an everyday aspect of publishing for newspapers and others traditional professional publishers, but users creating content in modern social media often lack the kind of capacities needed for thorough fact-checking and balanced expression of views.

4 Project Overview

4.1 Background and Approach

Background

The aim the case study was to develop a web site for an awareness campaign. The campaign was aimed at junior high school students for the purpose of reducing school bullying. The main message being communicated was that statistically, while 10% of students are bullied, 90% of students do not react in order help their friends. The objective was to reach out to every student who was witnessing bullying in the school community, but did not have the required courage to act and stop it. Bullying can cause significant harm for a child [46], and outsider who stays in the background silently accepts it and passively, though often unwillingly, promotes it.

As an awareness campaign, the project's aim was not as such to create sales, but rather to create buzz and comprehension regarding the subject matter among the public. For this purpose, particularly among the young target group, social media offers great potential [47] and the project was to include new and effective ways of utilizing social media tools.

Approach

The aim of the project was to reach and engage teenage students in a more street-credible fashion than in previous similar projects. The main elements in the campaign consisted of a music video, a Facebook community and a campaign website. The website was to include a blog section, interactive map mash-up for promoting the visitor's own junior high school and a collaborative rich application for producing customized music videos. All these elements would interact with each other, creating an engaging combination.

The song of the music video would be promoted to radio stations, and the video itself would aim to reach viewers through television and video sharing websites, such as YouTube. The Facebook community would have regular updates on the subject of bul-

lying, and would aim to engage the community and create vibrant conversation. The website would be promoted heavily on Facebook, as well as in the context of the music video. On the campaign website, users would in turn be encouraged to share content to Facebook in multiple ways, view the video and invite their friends to create their own customized version of the music video. Another option for participating through the site would also include simply raising a flag for their school in the map mash-up and creating a blog with selected friends from social networks. The most active blogger would be awarded with a free spring celebration concert for their school, featuring top artists. In addition, the project, its Facebook group and website would be promoted directly to student tutors in schools around the country.

The campaign made use of wide celebrity interest in collaborating in the production of the music video. The video featured many Finnish top musicians and youth idols, such as Jenni Vartiainen, Jussi Elo and Mariska. The music for the video was composed by top producer Jukka Immonen and veteran rapper Elastinen, and was performed by up-and-coming rapper Timo Pieni Huijaus, featuring other celebrities in the chorus section of the song. In the interactive video recording application, the visitors would then be given a chance to create their own music videos, featuring themselves alongside the celebrities.

In the context of larger social media landscape, the application would aim to exemplify a new way of producing rich, in this case audiovisual, UGC on the web. Theoretically, its many-to-many work flow would resemble a forum discussion in the sense that it is initiated by a particular user but several others would also be able to take part. However, from a privacy perspective, it shares more in common with a social network or a collaborative software application, since only certain individuals are granted rights to participate in the production process. The mash-up and blog sections would follow more along common and standardized social media work flows. The blog would offer typical blog functionality such as posting different types of content and visitor comments, a differentiating factor perhaps being that only invited Facebook friends would able to comment on posts. The mash-up would overlay two types of data on the map, Finnish junior high schools and Walkers youth cafes, depending on their respective location coordinates. They could then be viewed utilizing two types of search function-

alities or by dragging the map, which are rather common features in such map applications.

Participants

The company primarily behind the project was the popular teen magazine Suosikki, which is the longest publicized youth magazine in Finland, and has been on the Finnish store shelves since 1961. National children's charity organization, Mannerheimin lastensuojeluliitto, or Mannerheim League for Child Welfare, was another sponsor of the project. The organization has over 92000 members and 566 local sections, and aims to promote children's issues and interest in society. Links to the youth cafe Walker's were also provided on the site. They are maintained by a social youth charity Aseman Lapset ry whose fundamental mission is to guide young peoples' growth and abilities to make healthy and beneficial decisions in life.

Advertising agency for the project was Tehtaankatu, founded in 2009 by industry veteran Samuli Harjunpää, who has won awards in the field since 1996. The music video was produced by Komia Helsinki, a Helsinki-based video production agency. The production of the campaign website was done at !Noob Digital Helsinki, a company specializing in digital services for advertising agencies, and is the main focus in the thesis. More detailed introduction on the participants is provided in appendix 1.

4.2 Main Features

As mentioned earlier, the main sections of the site were the music video application, the flag mash-up and the blog section. Facebook Connect was required to use the first two sections, which leveraged on social networking data such as user friend lists, and would required extended Facebook permissions in order to facilitate for features such as posting content. Facebook Connect was implemented by using Facebook's PHP and JavaScript Software developmet kits (SDK). If the user had not earlier provided extended permission for the site, a pop-up or a redirection page would be provided for Facebook login before accessing pages requiring Facebook features.

The blog section consisted of the blogs created by users. Two views were provided, for blog lists and individual blogs. The section, seen in figure 4, was visible to all users and

did not require a separate Facebook login. However, in order to create a blog, user had to participate in one of the other sections.

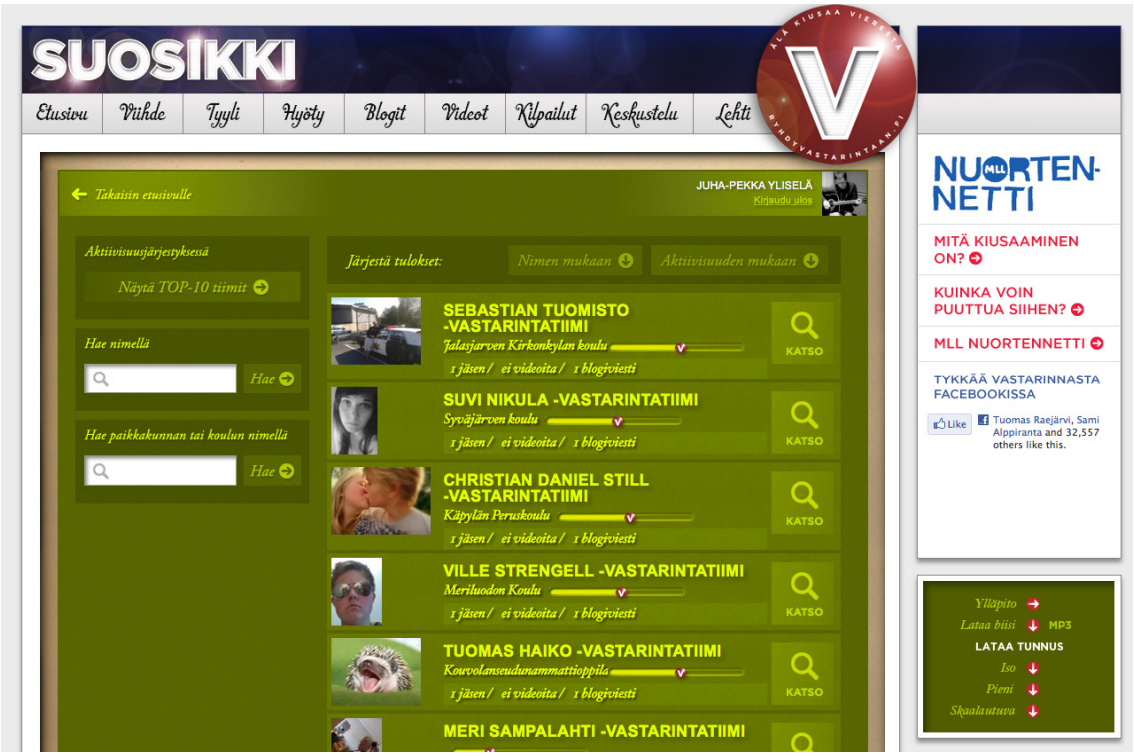

Figure 4. List view of user blogs.

After blog creation, users would be able to invite their friends, and that way create the anti-bullying team. The list section also included search functionality and top ten listings of blogs.

The mash-up section of the website provided the user with means to raise an anti-bullying flag for her junior high school, or find a youth cafe nearest to her. All relevant locations were listed and visualized as icons on a map centered on Finland, as seen in figure 5.

Figure 5. Google Maps based mash-up.

The map was based on Google Maps application programming interface (API), and included JavaScript-based features such as overlays, customized zooming and drag-and-drop functionality. The user could search distinct school locations by either their names or cities. The links to the Walker's youth cafes were implemented as drop-down box displaying the hometowns of the cafes.

4.3 Visual Design

Visual simplicity is important in such projects because of Web users' propensity to simply glance over a web page without actually reading much of the text [36 - ok]. The front page highlighted the two links to the main interactive sections of the site, labeled ”Raise a flag” and ”Create a music video”. Both links consisted of large visual image elements, clearly promoting these as the main action of the site. A sub-menu consisting of icons also had links to watching the music video and viewing the existing team blogs. Links to the interactive sections were also provided in the sub menu to increase their prominence. The main message slogan and associated graphic was placed on top of the links in addition to a Facebook connect button, as shown in figure

6. Visual hierarchy was utilised in large font size variations to accentuate the main campaign message and the main user interactions. The color palette for the site consisted mainly of green as well as red, which is also the color for the campaign logo.

Figure 6. Website front page.

In addition to the actual site elements, the layout incorporated links to the project's main sponsors. The menu navigation modeled after Suosikki magazine's own website was placed on the site in its top header. Using the navigation, a visitor could directly navigate to Suosikki's site at any point while browsing the site. Links to Mannerheim League for Child Welfare's site's bullying-related pages were also permanenely visible in the left sidebar. This way the user could quickly and easily learn more about the subject, and get information from a credible expert source.

4.4 System Architecture

The essential components of the system architecture were the web server, media server and third party services. In order to access the basic static portion of the web site,

consisting of the front page and blog section, the user's browser was served a standard web page by the server over an HTTP connection.

Facebook Connect

When accessing the more interactive sections of the site, other servers would come into play as well. A login feature would be initially required, and the user is directed to a page provided by Facebook's servers, as depicted by the "GET OAuth Dialog" flow in figure 7. The user is here notified of the extended permissions requested by the application, and provided a form for logging in.

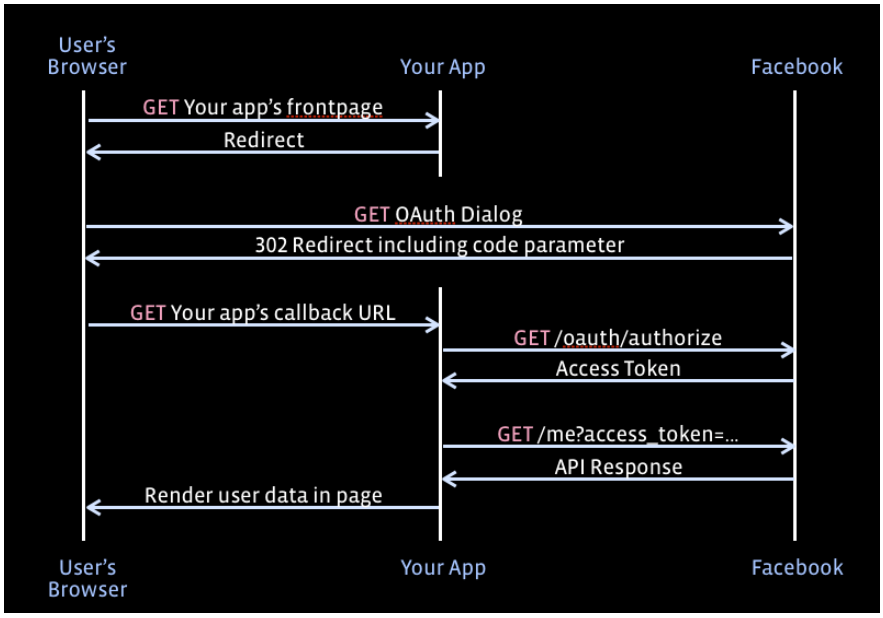

Figure 7. Facebook authentication flow [48].

Subsequently, a dialog for granting permissions is displayed, and the visitor is directed back to the original website. Additional data can now be requested through the use of an access token, as seen in figure and provided by the platform's SDK, and content can be customized for the specific user browsing the site.

Mash-up

In case of the mash-up section being accessed, next component coming to play is the Google server providing the actual map data the mash-up is based on. It is provided

with an identifiable developer key, used for monitoring application API usage, and relevant parameters for determining map location and zoom levels, among other things.

As the user drags, zooms or searches in application, the Google server updates the map data along the provided parameter values. The mash-up application made use of the official user interface library of jQuery, an open source JavaScript library developed to simplify JavaScript development, to provide for some of the interactive features.

Rich Media Application

”Make your own music video” link would direct the user to this section of the site. The section was based on Adobe Flash technology, to enable rich animations, and in particular, the possibility of recording the web cam and microphone feeds from user's computer. In the application, parts of the actual music video could be re-performed through either an actual performance or by lip-syncing. The application would allow the selection for parts of the song, such as chorus or verse, visually through an easy to use drag-and-drop interface. Parts could also be selected for user's Facebook friends, selected from the a friend list, and subsequently inviting them to participate in the video. A visual how-to process flow was presented for the user prior to selection, indicating how to begin the recording process.

The initial view of the recording application utilised Facebook data for user-customized features, such as name, profile image. These were acquired by calling a php, as seen in listing 1 in appendix 2, script that utilized to Facebook’s PHP SDK for retrieving the data. The profile data was displayed in the right top corner of the application screen, as illustrated in figure 9.

Figure 9. Flash video application interface.

When a user recorded video, the Flash plugin connected with the media server which created on single Flash Video (FLV) file containing the audio and video for the recorded take. Once all sections the user wished to contribute into were covered, the recording ended and Flash sent the data regarding the video file and section selections to a php script on the media server for final processing. The ActionScript code used for this and the logic for previewing the edited version can be seen in listings 2 and 3 in appendix 2. If the user decided to save the recording, he or she was then directed back into a PHP script on the web server for inviting Facebook friends to participate in the video.

Video Streaming Server

Recording webcam video from Flash requires certain server-side capabilities. In order to achieve reliability, the optimal management of resources and the more advanced features, a dedicated streaming server was used for the task. The recording was done utilizing Real-time Messaging Protocol (RTMP) streaming between the Flash application and the server, allowing the user to instantaneously view any part of the original or the newly processed video she had contributed to.

Wowza Streaming Server was chosen for the task, because of earlier experience on working with it, and lower cost associated in comparison to Flash Media Server, which was the other considered option. Wowza Media Server license costs around one thousand U.S. Dollars (USD), while Flash Media Server has multiple versions with varying features available, with prices ranging from a thousand to fifty thousand USD [49].

Wowza Media Server in itself is a Java program, that was installed on Linux system that was also running an Apache server with PHP installed. As demonstrated in listing 4 of appendix 2, PHP scripts were used to handle the actual video processing from original audio and video content, as well as the webcam material recorded through Flash and the media server. The interaction between media the various servers can be seen in figure 8 below.

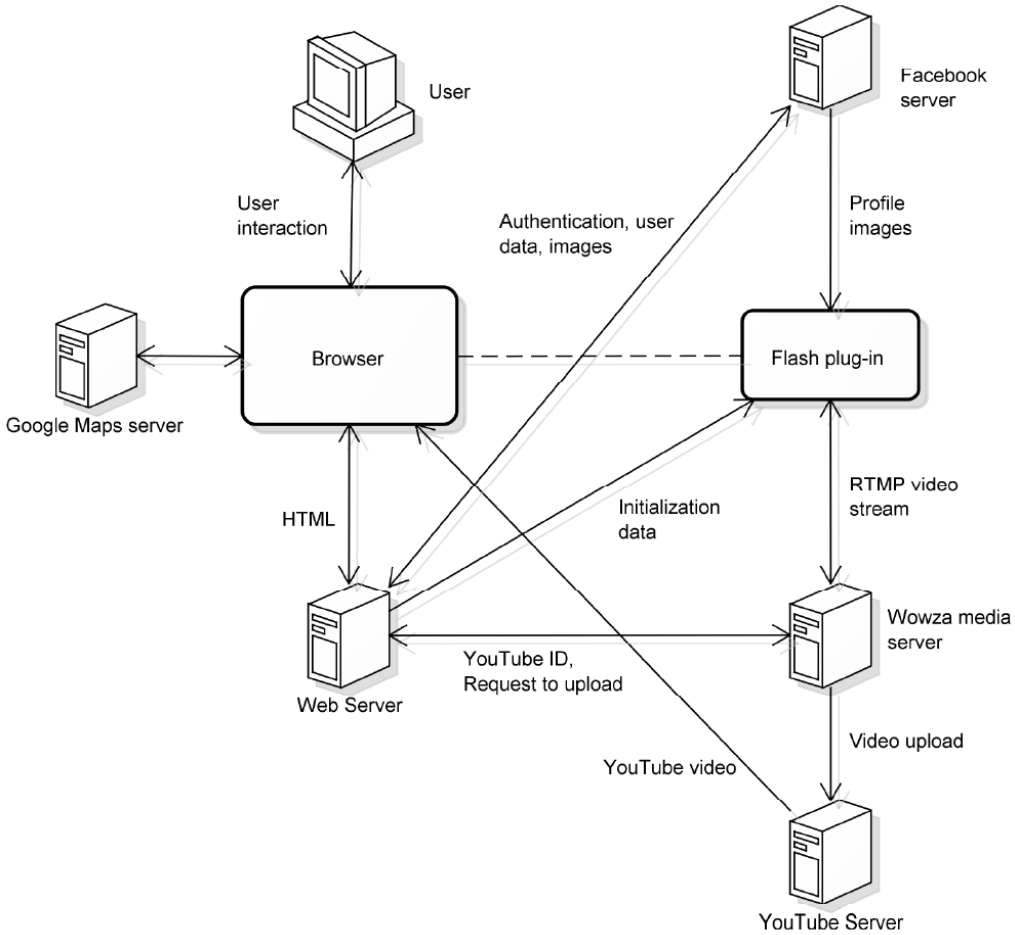

Figure 8. System architecture.

After the video had been processed, it was saved on the streaming server. It would then be used as material for the next recording, by another user in a group. Once finished or earlier if prompted by the user, it would be uploaded from the server into the YouTube video site by using YouTube's API.

5 Production Process

Typically for the advertising industry, the schedule for the project was tight and the project specifications kept constantly changing until the publication deadline. The project management method broadly adapted agile development methods in the sense that current feature requirements were divided into daily prioritized lists and were worked on in sprints to provide the customer with an iteration of the software.

5.1 Concept

In the initial meetings between advertising agency and production company the concept of the website was communicated using wireframes and mind maps as tools in addition to discussing the subject. Figure 10 below, is among the first work flow mind maps describing the website.

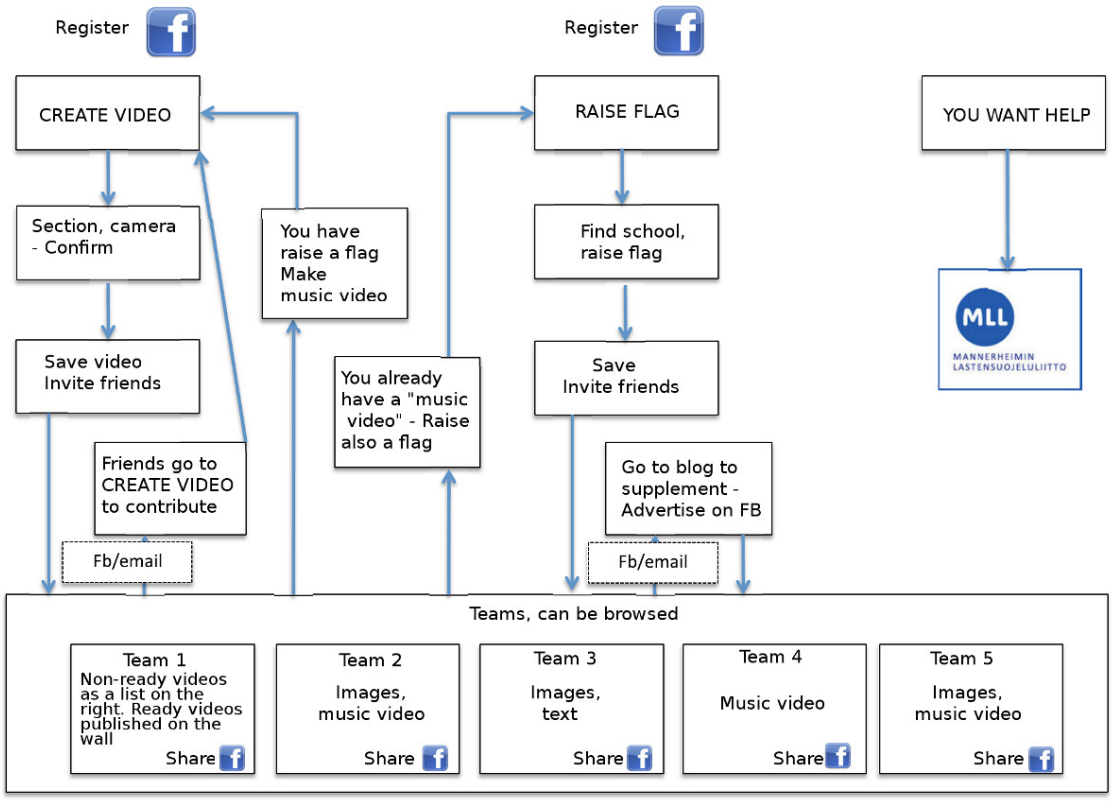

Figure 10. The initial concept work flow chart, copied from original presentation.

The main content base is provided by the team section, and two activity loops are offered for a visitor to take part. Facebook connectivity permeates the entire process, and links to helpful information are provided separately.

The production process itself commenced with a briefing meeting, where the project concept and relevant screenshots were presented to the production team. The tasks were divided between the developers, and a Flash development commenced on the video recording application, while a back-end engineer started to design the site application logic and database structure. In parallel, the front-end HTML coding begun, based on supplied layouts, as well as the development of the JavaScript application using Google Maps API.

Many of the features of the Flash application were initially obscure and unknown, such as the amount of original music videos to choose from, the exact recording options and the kind of processing that would be applied to a user's recording. Work also commenced for the ”Raise a flag” page, starting with researching overlay and drag-and-drop options, and similar projects done in the past. The decision was made to use the Google Maps API version 3, which was the latest version of the interface, although earlier similar projects within the company had been produced with the earlier, since deprecated version 2.

The database design needed to provide for such features as storing user identification data, unlimited music video groups, unlimited friend invites, video clip identification data, blog content storage as well as geolocation data used in the mash-up application.

The campaign site was highly social in nature, and the social networking aspect was essential for the site. The friend invite functionality was designed to be implemented exclusively through Facebook, but since the API provided no means of sending private messages, the exact method of inviting a friend was to be researched. One option considered included sending an email to a friend, but since not every user provides an address visible for their friends, and other addresses cannot be retrieved wihout explicit consent from the particular friend, the option was scrapped. The invite functionality was finally accomplished by posting the invite link on the friend's wall, the privacy of which is determined by the Facebook friend, and that link redirecting the friend in question to the application. Other users that clicked the same link were redirected to

the site front page. The user identification and separate redirections were done by retrieving the ID of the user via the service's API. Implemented in this kind of semi-public manner, the invites would also act as elements that would create additional visibility for the site in the social network.

5.2 Revisions

Several revision and refinements were made to the site specifications as the project progressed. The customer made the first specification changes ten days after project initialization. The Flash application received a number of refinements in its requirements, such as the inclusion of a lip sync option, separate volume meter page for testing microphone capabilities, one instead of several music videos acting as the basis for the recordings and a feature that would place the user's web cam in a picture frame during the recording.

This called for rather major technical changes in the application, since this type of a frame overlay added in a Flash application cannot be stored to the output video file, but needs to be separately added to the video clip using server side processing. A few days later the requirements were updated once more, to overlay a shadow layer on top of the entire user recording as well. In addition, it was specified that all chorus sections of the song were to have major customized image processing, such as multiplying, skewing the web cam feed, as well as overlaying it on top of a video background. At a later stage, yet more changes were requested, such as applying filters for manipulation the image saturation and brightness and modifying the video aspect ratio.

After some research and testing, the solution used to satisfy the requirements were the FFMPEG, SOX and MPG123 command line tools through system calls from PHP. FFMPEG is developed as an open source software project, and it is being used in many popular programs, such as Google Chrome and the open source 3D studio Blender. It offers various types of video and audio processing functionality, such as splitting, combining and converting between formats. SOX is an open source project as well, and is a comprehensive library for processing audio. Some additional file format conversion was done using the mpg123 decoder library.

The final processing logic for a given recording became rather complex, due to various stages of processing applied to different sections of the song, multiple recording options, multiple users and plethora of image processing done for the video before the publishing stage, as seen in the listing 4 in appendix 2. The process begins with the Flash application defining a section of the song the user has chosen to perform, and subsequently recording a video and audio take from the webcam to the streaming server. Flash then sends an HTTP request to a PHP script on the Apache server to notify that a new version has been recorded, along with parameters indicating the section selection, audio options, and other relevant data.

On the audio front, lip sync as well as singing recording options were made available for the clips. This meant that the material used for the final audio file consisted of the original vocal tracks, the original backing track, and user-provided audio clips from the webcam feed. These were then edited together, depending on the sections of the song the user had selected. The audio containing the recorded take was output as an FLV file by the Wowza streaming server, the total length of the song in duration. The relevant sections of audio were first cut from the file using FFMPEG, using the time values specified from song intersections, in milliseconds. The resulting audio was then converted from mp3 to wav format using MPG123. Finally, the audio was joined with original song audio clips using SOX, and adjoined with the video stream utilizing FFMPEG.

For the video material, the processing was done entirely using FFMPEG. The recorded clips were cut out from the original FLV file by the song intersection points specified by the parameters sent from Flash. Next, further processing was performed on the clip if the section of the song required it. For each chorus, three separate video effects had been designed, each of which utilized some form of overlaying. If the user recorded a take on a chorus section, the music video would display the web cam feed overlaid on either a classroom TV screen, multiple photos in a school yearbook, or a poster on a classroom wall. To ensure precise frame-by-frame cutting, the video was placed on top of the original video, not by specifying the cutting position in milliseconds as is standard in FFMPEG options, but by converting the frames to images in Joint Photographic Experts Group (JPEG) format and renaming them according to frame position and editing the clip by combining the appropriate frame images.

At this stage, another revision request that followed was that the Google Maps mash-up was to be modified to include a drop-down list of youth cafes, which was not mentioned in the very initial requirements. This was implemented as a simple html drop-down list, styled in a manner to fit the look and feel of the site, and provided users a quick way to find the location nearest to them.

Certain Facebook wall post features also had to be modified from the initial brief, either to provide users more customizable options or to be in accordance with the platform's API policies. Facebook sharing was first thought to be made automatic, and a notification of a user raising a flag would instantly be posted on the user's Facebook Wall. As the idea was researched, it was found to be non-compatible with Facebook's platform policies, and the feature was switched from an automatic post by the PHP API to a prompt where the user could personalize the text to be shared. This was accomplished by using Facebook's JavaScript API. Another publishing feature requiring further refinement was the publishing of the final video to YouTube, which was initially done automatically once the last participant had recorded a performance for the video. After the revision, ”the host user” of the video could publish it anytime, whether or not the other invitees had performed or not. This feature was added to promote publishing of videos also in the case that some participants did not accept the invite. The blog creation feature was left as it was developed initially, requiring no separate prompt, and a blog was created automatically after raising a flag or recording a video. However, a clear option to for deleting the blog was added for the owner, to give more control to the user over the blog content.

Despite of the very tight schedule of less than a month of production time for the project, most elements of the site progressed well and without major issues while accommodating for the various updated requirements. The aspect requiring the most iterations and generating the most improvement requests was the video recording, processing and publishing that was done on the streaming server. Audio or video timing issues were perceived on some systems, and at times syncing seemed to cause issues in the final videos. This was however not a problem perceived significantly during testing, and it was concluded that low-quality web cam audio and video drivers as well as poor analog-to-digital converters are probably the culprit to the problem, and no easy fixes exist for users using such hardware.

5.3 Reception

As the site was published, it became apparent that participating, especially in the case of video recording, was requiring somewhat too much from the user, and participation level in the beginning was rather low. One major obstacle for more user interaction was that Facebook Connect was being required of the user immediately if any of the more relevant features were to be used, and no clarification was given regarding the privacy policy of the site, while it was requesting extended user permissions. Because of technical limitations of the API, no customized message could be incorporated directly to the Facebook Connect dialog. Instead, it was decided that clicking on the links to the parts of the site that required extended permissions would prompt a lightbox overlay clearly stating the basic privacy policy for the data usage, and only in the next stage would the user be directed to complete the actual Facebook Connect.

The blogs section was also separated from the Connect requirement, and all visitors could browse and view the blogs when on the site. Some other features that were added included contact form for customer support, as well as download links for additional media, such as mp3 file of the song and various logos.

Overall, the users clearly preferred actions that were fast and easy to accomplish on the site. This principle can be seen also elsewhere in social media, where it has been discovered that users are very impatient when browsing the web. As user experience expert Jacob Nielsen writes, sites being responsive is important because humans do not perform as well when required to wait for page loads or additional steps in the process. He also notes that quick user interfaces matter because people want to feel in control of the use experience, instead of a computer or a third party hindering the process.

This tendency manifested in two ways: 1) Users by far preferred to raise a flag in comparison to recording their own music video. 2) Requiring Facebook Connect for a site section markedly decreased user interest for the particular section. In the case of the map mash-up, the threshold for participation was quite low in that while it did require connection with Facebook, raising a flag and sharing the results were accomplished by a simple click. The video recording feature clearly requires much more effort on the user's part, and some may well also feel anxious about performing in this way

as the final product will be published to the entire public. The threshold is clearly much higher for participation than simply a few glances and a mouse click.

In addition, the competition element of the campaign was directed to only encourage active blogging in whatever form, and did not require making a music video in particular. The blogging feature was in fact quite popular in comparison, and becoming a blog group member required a low amount of effort indeed, as it was accomplish by simply clicking a link and entering the site.

6 Results

6.1 Statistics

One of the best ways to measure general traffic to the website is by using JavaScript-based tools such as Google Analytics. While they do require the scripting language to be enabled in the browser, they provide quite accurate data this is the default setting on most browsers. The campaign site's page views can be seen in the table below, as retrieved from Google Analytics.

Table 2. Unique page views, 1 April 2011 to 15 June 2011. Data copied from project account, Google Analytics [16].

Page	Unique visitors
Frontpage	7542
Teams	1215
Map mash-up	337
Recording application	165
Video created	41
Invite friends	138

As exemplified in table 2, the visitor counts rapidly declined for the sections requiring Facebook Connect, such as the recording application and the map mash-up, in comparison to fully public pages such as the front page or the blog section. And this occurred despite the prominent visual image links on the front page. The statistics gathered form the database verify the tendency to shy away from more advanced features, as shown in table 3.

Table 3. Application database statistics.

Posts	Video
356 Total	146 Unique visits
301 automatic posts	21 users recorded clips

6 video publish posts	16 users saved a recording
55 other posts	5 hosts published videos
Comments	Clips
75 Total	291 Total
	93 with lipsync
Flags raised	
261 Total	

261 flags were raised on the mash-up page, but only 16 users were satisfied enough with a recorded clip to save it. 146 users entered the video recording application, but a mere 5 users published music videos all the way to YouTube, some of them more than once however. 75 comments and 55 original posts were published in the blog section. This also shows that these types of familiar, low-threshold actions can be quite popular to users. Lip sync feature proved to be a good option to provide, since it was selected in around a third of recordings.

The official music video for the campaign, hosted on YouTube, gathered more than 15000 views during the campaign's most active period, as can be seen from table 4.

Table 4. Total video views 1 April 2011 to 15 June 2011. Copied from project account, YouTube Analytics [51].

Video	Total views	Facebook views
Official Vastarinta video	15524	3139
Top contestant	752	192

The most popular user-generated videos were viewed a few hundred times during the same period, with the popular video topping the statistics with 752 views. Some, but only a minority of views derived from Facebook, meaning that the videos were embedded in the campaign’s or a user’s status update. As for other activity in social networks, the Ryhdyvastarintaan.fi project had gathered 32446 fans for its Facebook page by

April 2012. When that figure is compared to current Facebook like counts of some of the most popular Finnish brands [52], it ranks comparatively to some of best-known Finnish athletes such as Kimi Räikkönen or Saku Koivu, and beverages Karhu beer or Finlandia Vodka. The rank is significantly higher than some of the best-known charities in Finland, like Amnesty International Finland or Mannerheim League for Child Welfare, while still lagging far behind brands with strong international fan bases like Nokia or the rock band HIM, as shown in table 5.

Table 5. A sample of Facebook like counts for some well-known Finnish brands. Adapted from Salmenkivi (2009) [52].

Brand	Like count
Nokia	7985486
HIM	1261119
Finlandia Vodka	52923
Saku Koivu	48479
Kimi Räikkönen	32747
Ryhdyvastarintaan.fi	*32446*
Suosikki	27622
Karhu beer	21939
Amnesty Internation Finland	8516
Mannerheim League for Child Welfare	6453

As marked in the table, the fan count also surpassed the dedicated Facebook page of the main sponsor Suosikki magazine, which suggests valuable social media boost to the magazine's online presence as well.

6.2 User feedback and awards

The campaign was nominated in the national audiovisual advertising contest Voitto-kilpailu, and was awarded as the audience favorite, as seen in figure 11.

Figure 11. Ryhdy Vastarintaan campaign mentioned on the Voittokilpailu website [53].

Voitto is a yearly recurring event and organized by the Association of Independent Producers in Finland, the Association of Finnish Advertisers and the Finnish Marketing Association MARK. As can be seen from figure 11, Ryhdy Vastarintaan was nominated in the Internet category of the contest.

In a survey sent to video application users, found in appendix 3, the feedback regarding the feature was markedly positive. Even though the participation level was rather low, the respondents who did answer gave the application an average grade of 8,57 on a scale of 4 to 10. Out of the seven people who participated in the survey, only one had encountered any problems while recording. Eighty per cent of respondents had also successfully invited friends to collaborate and published their videos without encountering any obstacles.

Conclusions

The project served its purpose in generating public awareness and participation around the important issue of school bullying. With over 30000 Facebook fans and 15000 video views, the campaign clearly amassed attention and struck a chord with a good portion of its target group. However, regarding the campaign web site, certain sections were notably preferred over others. The sum of experience gained from the project points to the same conclusion as much of the related research: Successful social media campaigns need to be as light-weight, fast and low-threshold for the user as possible. While doing that, it is useful to provide the most active core of users with extensive functionality, and allow them to contribute in more sophisticated ways to the content base. However, providing several levels for participation is necessary, as the vast majority of visitors is likely to take part in a much more fickle way. The applications should also only ask for as little effort and few details as is absolutely necessary for a given function. In designing such services, it is also worth remembering that many users can be hesitant to position themselves as a star performer and enjoy the limelight when producing content.

The fact that most people are quite content with passive consumption of media [54], may be a useful lesson in this age of social media hype. This does not mean that social media does not represent enormous opportunities, but it does put us on a more realistic footing when analyzing the expectations on the degree of active participation for new types of services.

Nielsen puts the figure of social media lurkers around 90 per cent, and defines them as those who do not generally contribute at all in terms of content. Nine per cent of web users contribute from time to time, and a tiny 1 per cent creates most of the content in social media [55]. This is well illustrated in Ross Mayfield's diagram about the Power Law of Participation in figure 11.

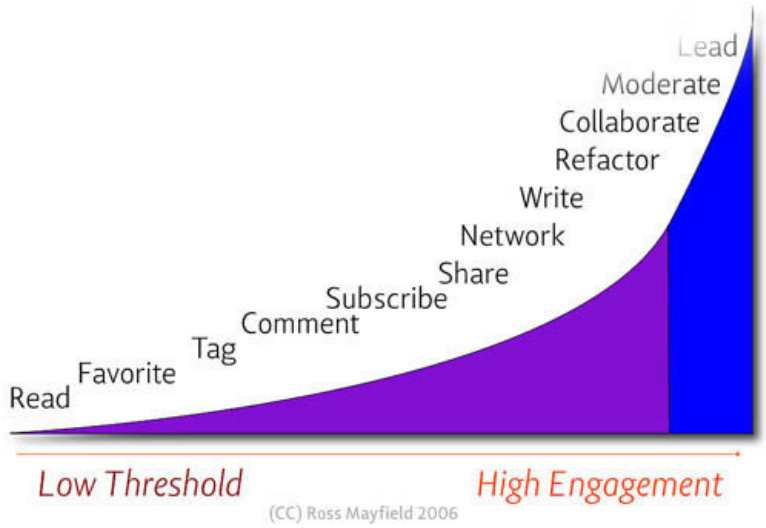

Figure 11. Power Law of Participation, copied from At Large [56].

It demonstrates how participation volume accumulates to a minority of most active users in an exponential fashion, followed by a "long tail" of additional content produced by the majority [57]. This leads us to the fact that not all users are equal, and only a small minority can even be expected to participate beyond the more low-threshold actions. At the same time, if a campaign operating in social media is too low-threshold, say consisting of merely liking a Facebook page, it does not take any advantage on the power of the Internet's capabilitities in user expressiveness. This dilemma between expresiveness and ease of participation, therefore, continues to be a central area of focus when designing social media services [58]. Users on the Internet will continue to come in varying sets of technical abilities, age groups, interest levels and previous experiences, and this must be taken into consideration also when creating rich collaborative services that promote novel ways of producing content.

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Appendix 1. Agencies and organizations

Suosikki

The main organization behind the campaign, Suosikki, is a leading Finnish Youth magazine that focuses on topics like popular youth culture, music, and celebrity interviews.

Mannerheimin lastensuojeluliitto

A major partner in the campaign, Mannerheim League for Child Welfare, is an third sector NGO whose membership is open to the members of the public. It promotes children's issues and benefit in society and in Finnish decision-making.

Aseman lapset ry

Aseman lapset ry is a national youth organization whose mission is to promote the healthy growth of Finnish youth and prevent exclusion, violence, crime and substance abuse.

Oy Tehtaankatu Ab

The advertising agency Tehtaankatu is a Finnish company founded by Samuli Harjunpää, who a long record of award-laden excellence in Finnish advertising campaigns since the mid-nineties.

KOMIA Helsinki Oy

The production company for the campaign music video, KOMIA helsinki, is a Helsinki based full service production house for moving image.

!Noob Digital Helsinki Oy

!Noob Digital Helsinki is a digital production company specialized in serving advertising agencies, founded in 2006. Its track record includes digital productions produced for major Finnish advertising agencies, such as TBWA\Helsinki, Bob Helsinki and DDB, and end clients such as Sonera, OP-Pohjola and Nissan Europe. In recent times it has also broadened its customer base outside Finland, branched out to film production and put more focus into digital product innovation.

Appendix 2. Code examples

Listing 1. ActionScript example - Initialize variables. Set necessary URL paths for servers and streaming server.

```
var this_mc:MovieClip = this;
var user_obj:Object = new Object();

// load crossdomain.xml so flash can access facebook profile pictures
Security.loadPolicyFile("http://profile.ak.fbcdn.net/crossdomain.xml");

var server_url:String = "";
var userData_url:String = server_url+"slot.php";
var songData_url:String = "";
var baseVideo_url:String = "rtmp://suosikkistream.inoob.fi/vod/flashvideos/
mp4:070411_MLL_Musiikkivideo_400x225.f4v";

// existing songParts
var singParts_array:Array = new Array();

// song structure for selection limits
var xml_url:String = server_url+"xml/";
var songXML_url:String =
xml_url+"song_structure.xml"+"?rnd="+Math.round(Math.random()*100000);
var song_array:Array = new Array();
var lyricsXML_url:String =
xml_url+"song_lyrics.xml"+"?rnd="+Math.round(Math.random()*100000);
var lyrics_array:Array = new Array();
```

Listing 2. ActionScript example - Set data to indicate parts of recording. Send request to streaming server to start processing data.

```
function publishFiles():void{
   slider_mc.visible = false;
   mask_mc.width = 80;
   timeline_mc.start_mask.width = 100;
   rLevel_mc.loader_mc.visible = true;
   video_mc.visible = false;
   playpause_mc.visible = false;
   ready_mc.visible = false;
   loader_mp4_mc.visible = false;
   recordagain_mc.visible = false;
   fullscreen_mc.visible = false;
   this_mc.visible = true;
   var clipData_vars:URLVariables = new URLVariables();
   clipData_vars.v_ident1 = page_mc.videoId_str;
   clipData_vars.a_ident1 = page_mc.audioId_str;
   clipData_vars.video_id = rLevel_mc.user_obj.video_id;
   clipData_vars.full = (rLevel_mc.timeline_full) ? 1 : 0;
   for(var i:Number=0;i<page_mc.recClips_array.length;i++){
      clipData_vars["clip"+(i+1)+"_id"] = page_mc.recClips_array[i].clip_id;
      clipData_vars["clip"+(i+1)+"_lipsync"] =
      page_mc.recClips_array[i].lipsync;
   }

   var send_req:URLRequest = new URLRequest();
   send_req.url = publishVideo_url;
   send_req.method = URLRequestMethod.POST;
   send_req.data = clipData_vars;
   trace("PUBLISH: "+unescape(clipData_vars.toString()));
   var back:URLLoader=new URLLoader();
   back.dataFormat = URLLoaderDataFormat.VARIABLES;
   back.addEventListener (Event.COMPLETE, clipDataSentOk);
```

```
   // send publish, and wait for its return
   back.load(send_req);

   // while waiting, check progress of publish
   rLevel_mc.loader_mc.l_txt.text = 0;
   rLevel_mc.loader_mc.visible = true;
   progress_timeout = setTimeout(getProgressData, 1000);
}
```

Listing 3. ActionScript example - Preview recorded video when processing is done.

```
function clipDataSentOk(e:Event):void
{
   trace(e.target.data);

   // stop progress checker
   clearTimeout(progress_timeout);
   rLevel_mc.loader_mc.l_txt.text = "100";
   mask_mc.width = maskMax_nr;
   trace(unescape(e.target.data.toString()));
   if((e.target.data.status).toString()=="1"){
      rLevel_mc.loader_mc.visible = false;
      videoUrl_str =
      "rtmp://suosikkistream.inoob.fi/vod/"+rLevel_mc.user_obj.video_id+"/flv:p
      review.flv";

      //videoUrl_str = "rtmp://suosikkistream.inoob.fi/
      vod/"+rLevel_mc.user_obj.video_id+"/mp4:preview.mp4";
      video_mc.loadVideo(videoUrl_str);
      showInfoText();
      timeline_mc.start_mask.width = 1;
      prosNow_nr = 0;
      updateSliderPosition(0);
      slider_mc.visible = true;
      video_mc.visible = true;
      playpause_mc.visible = true;
      recordagain_mc.visible = true;
      fullscreen_mc.visible = true;
      startMp4Loader();
   }else{
      trace("ERROR IN PUBLISHING!");
      rLevel_mc.error_mc.visible = true;
   }
}
```

Listing 4. PHP example - Splitting and recompiling a user recording.

```
$i = 1;
foreach($clips as $id => $clip){

    // Split data
    $juliste = $tv = $paperi = false;
    $start = $clip['start'];
    $startframe = $clip['frame'];
    $length = $clip['length'];
    $clip['style'] = true;
    $clipdir = $folder.$id.'/';
    cmd('mkdir -p '.$clipdir.' ; rm -rf '.$clipdir.'*');

    $videoName = $id.'.mp4';
    $audioName = $id;
    $clipvideo = $tmpdir.$videoName;
    $clipaudio = $tmpdir.$audioName.'.mp3';
    $clipaudiofinal = $folder.$audioName.".wav";
```

```
// Video split
cmd('ffmpeg -an -y -i '.$origVideo.' -ss '.$start.' -t '.$length.' -r 50 '.
$clipvideo);
cp($clipvideo,$clipvideo.'_unmodified.mp4');

    // Audio split
    if($clip['lipsync'] == 0){
        //Audio only split
        cmd('ffmpeg -vn -sameq -y -i '.$origAudio.' -ss '.$start.' -t
'.$length.' -ac 2 '.$clipaudio);
        // Convert mp3 track to wav
        cmd("mpg123 -w ".$clipaudiofinal." ".$clipaudio);
    }

    if($tv || $juliste || $paperi) {
        // Switch first file to size 320x240 (if users video include -an)
        $clipvideo_240 = $clipvideo."_240.mp4";
        cmd("ffmpeg -y -an -i {$clipvideo} -vf 'scale=-1:240' -sameq
".$clipvideo_240);


       // Crop to 320 wide
        $clipvideo_320x240 = $clipvideo."_320x240.mp4";
        cmd("ffmpeg -y -i ".$clipvideo_240." -vf 'crop=320:240:in_w/2-160:0' -
sameq ".              $clipvideo_320x240);

        if($juliste) {
            $output = $clipvideo.'_output.mp4';
            $source_162x202 = $clipvideo.'_source_162x202.mp4';
            $output_162x202 = $clipvideo.'_output_162x202.mp4';
            $source = $clipvideo.'_source.mp4';
            cmd('ffmpeg -y -i '.$clipvideo_320x240.' -vf "scale=-1:202" -sameq
'.$output);
            cmd('ffmpeg -y -i '.$output.' -vf "crop=162:202:in_w/2-98:0" -
sameq '.$source_162x202);
            cmd('ffmpeg -y -i '.$source_162x202.' -vf "rotate=1.5" -sameq
'.$output_162x202);

             // Place into poster
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i
'.$masterpath.'mov/juliste.mov  -vf "movie=0:mov:'.$output_162x202.'
[vid1];[in][vid1] overlay=122:66 [out]" -sameq '.$source);
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i '.$source.' -vf "mov-
ie=0:mov:'.$masterpath.'mov/juliste.mov [vid1];[in][vid1] overlay=0:0 [out]" -
sameq '.$clipvideo);
        }
        if($tv) {
            $output = $clipvideo.'_output.mp4';
            $source_160x122 = $clipvideo.'_source_160x122.mp4';
            $output_160x122 = $clipvideo.'_output_160x122.mp4';
            $source = $clipvideo.'_source.mp4';

            cmd('ffmpeg -y -i '.$clipvideo_320x240.' -vf "scale=-1:122" -sameq
'.$output);
            cmd('ffmpeg -y -i '.$output.' -vf "crop=160:122:in_w/2-1.5:0" -
sameq '.$output_160x122);
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i
'.$masterpath.'mov/tv.mov  -vf "movie=0:mov:'.$output_160x122.'
[vid1];[in][vid1] overlay=313:58 [out]" -sameq '.$source);
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i '.$source.' -vf "mov-
ie=0:mov:'.$masterpath.'mov/tv.mov [vid1];[in][vid1] overlay=0:0 [out]" -sameq
'.$clipvideo);
        }
        if($paperi) {
            $output = $clipvideo.'_output.mp4';
            $source_105x112 = $clipvideo.'_source_105x112.mp4';
            $output_105x112 = $clipvideo.'_output_105x112.mp4';
            $source = $clipvideo.'_source.mp4';
            cmd('ffmpeg -y -i '.$clipvideo_320x240.' -vf "scale=-1:112" -sameq
'.$output);
            cmd('ffmpeg -y -i '.$output.' -vf "crop=105:112:in_w/2-20:0" -
sameq '.$output_105x112);

           // Smallest size
            $source_53x58 = $clipvideo.'_source_53x58.mp4';
            $output_53x58 = $clipvideo.'_output_53x58.mp4';
```

```
            cmd('ffmpeg -y -i '.$clipvideo_320x240.' -vf "scale=-1:58" -sameq
'.$output);
            cmd('ffmpeg -y -i '.$output.' -vf "crop=53:58:in_w/2-11:0" -sameq
'.$output_53x58);

            $source_paperi = $clipvideo.'_paperi.mp4';
            $cmd = '/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i
'.$masterpath.'236x244_black.mp4 '.
                '-vf "movie=0:mp4:'.$output_105x112.'[bug1]; '.
                'movie=0:mp4:'.$output_105x112.'[bug2]; '.
                'movie=0:mp4:'.$output_53x58.'[bug3]; '.
                'movie=0:mp4:'.$output_53x58.'[bug4]; '.
                'movie=0:mp4:'.$output_53x58.'[bug5]; '.
                'movie=0:mp4:'.$output_53x58.'[bug6]; '.
                'movie=0:mp4:'.$output_53x58.'[bug7]; '.
                'movie=0:mp4:'.$output_53x58.'[bug8]; '.
                'movie=0:mp4:'.$output_53x58.'[bug9]; '.
                'movie=0:mp4:'.$output_53x58.'[bug10]; '.
                '[in][bug1] overlay=9:4:1 [in+bug1]; '.
                '[in+bug1][bug2] overlay=121:5:1 [in+bug2]; '.
                '[in+bug2][bug3] overlay=6:119:1 [in+bug3]; '.
                '[in+bug3][bug4] overlay=65:120:1 [in+bug4]; '.
                '[in+bug4][bug5] overlay=123:120:1   [in+bug5]; '.
                '[in+bug5][bug6] overlay=181:120:1 [in+bug6]; '.
                '[in+bug6][bug7] overlay=3:181:1 [in+bug7]; '.
                '[in+bug7][bug8] overlay=61:181:1 [in+bug8]; '.
                '[in+bug8][bug9] overlay=123:181:1 [in+bug9]; '.
                '[in+bug9][bug10] overlay=182:183:1 [out]" '.$source_paperi;
            cmd($cmd);

            $source = $clipvideo.'_source.mp4';
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i
'.$masterpath.'mov/paperi.mov  -vf "movie=0:mov:'.$source_paperi.'
[vid1];[in][vid1] overlay=234:53 [out]" -sameq '.$source);
            cmd('/opt/ffmpeg_omakaanto/bin/ffmpeg -y -i '.$source.' -vf "mov-
ie=0:mov:'.$masterpath.'mov/paperi.mov [vid1];[in][vid1] overlay=0:0 [out]" -
sameq '.$clipvideo);
        }
    }
    else {
        // Switch first file to size 640x360  (if users video include -an)
        $clipvideo_640x360 = $clipvideo."_640x360.mp4";

        cmd("ffmpeg -y -an -i ".$clipvideo." -vf 'crop=640:360:0:60' -sameq
".$clipvideo_640x360);
        cp($clipvideo_640x360,$clipvideo);
    }
    // Video to images
    cmd("ffmpeg -y -i ".$clipvideo." -sameq ".$clipdir.'frame_%04d.jpg');
    // Copy images to master
    cmd($masterpath.'renameframes.sh '.$startframe." ".$clipdir);

 if(!file_exists($thumbfile)) {
cmd("ffmpeg  -itsoffset -4  -i ".$clipvideo." -vcodec mjpeg -vframes 1 -an -f
rawvideo -sameq ".$thumbfile);
    }
    $i++;
}
$mergefiles = array();
for($i = 1; $i <= 18;  $i++) {
    $masterAudioclip = $masterpath.'rapaudio/'.$i.'.wav';
    $audioclip = $folder.$i.'.wav';
    $mergefiles[] = (file_exists($audioclip) ? $audioclip : $masterAudioclip);
    $clipdir = $folder.$i.'/';
    if(is_dir($clipdir)) {
        cmd("cp ".$clipdir."*.jpg ".$frames);
    }
}
$finalrap = $tmpdir.'finalrap.wav';
cmd("sox ".implode(" ",$mergefiles)." ".$finalrap);
$finalaudio = $tmpdir.'finalaudio.wav';
cmd("sox -m ".$masterpath."fullmusic.wav ".$finalrap." ".$finalaudio;

// Frames into video and attach audio
$finalvid = $tmpdir.'finalvid.mp4';
```

```
cmd('ffmpeg -y -i '.$frames.'frame_%04d.jpg -i '.$finalaudio.' -sameq -vcodec
libx264 -vpre medium  '.$finalvid);
$preview = $folder.'preview.mp4';
if(!move($finalvid,$preview)) {
    exit('status=0&preview_file_rename_failed');
}
$cmd = 'rm -rf '.$tmpdir." ; rm -rf ".$frames;
step();
echo 'status=1';
```

Appendix 3. User survey

Survey was conducted using the surveymonkey.com service in April and May 2012.

1. What grade would you give for the ryhdyvastarintaan.fi music recording feature?

4	5	6	7	8	9	10
0%	0%	0%	14,3%	42,9%	14,3%	28,6%

2. Was it easy to understand how video was recorded?

Yes	No
100%	0%

3. Did the recording go well?

Yes	No	Other (specify)
83,3%	16,7%	0%

4. If you invited friends were you successful and did it work as planned?

Yes, successfully	I did not	Other (specify)
80,0%	20,0%	0%

5. Did you publish your video?

Yes	No
80,0%	20,0%